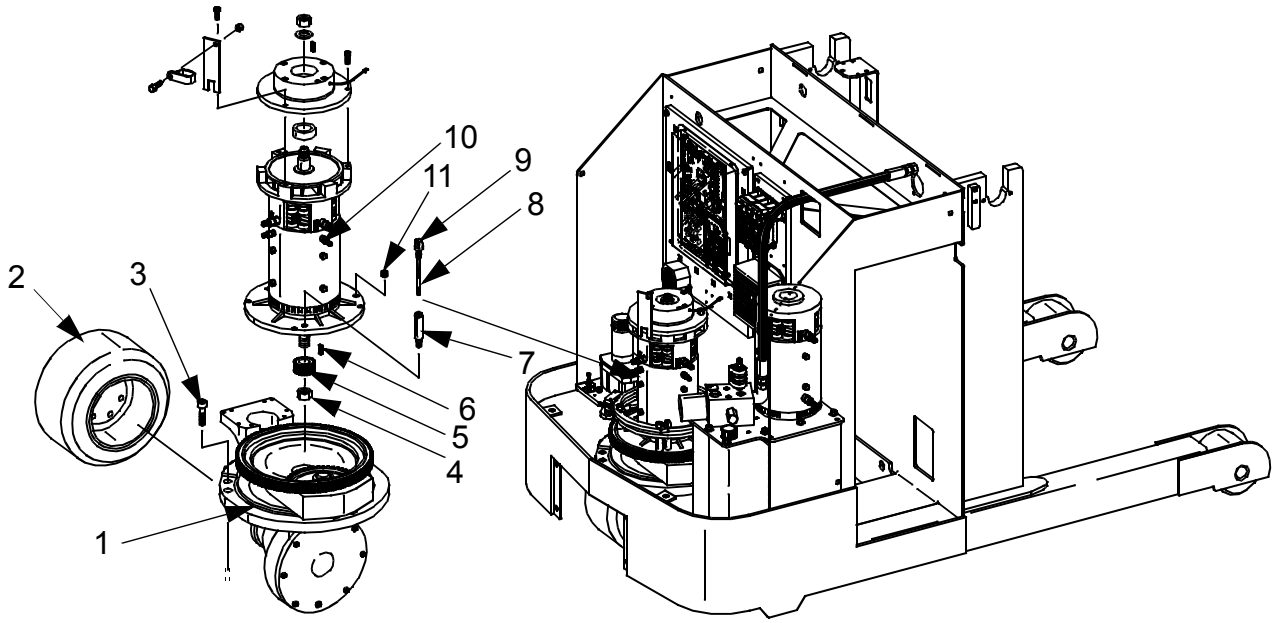
# Transmission




**Transmission Mounting**

| Item No. | Description |
|---|---|
| 1 | Transmission assembly |
| 2 | Drive wheel assembly |
| 3 | Screw |
| 4 | Nut |
| 5 | Gear |
| 6 | Key |
| 7 | Plug, dipstick |
| 8 | Dipstick |
| 9 | O ring |
| 10 | Drive motor |
| 11 | Plug, fill |

# 1. Theory of Operation

This transmission is of the double reduction gear type. The gears are a combination of helical and bevel gears for strength and low noise. The final drive gear is mounted on opposing tapered roller bearings. Gears and bearings are enclosed in an oil filled case. The drive motor is mounted externally with the drive motor pinion gear mounted on the armature shaft. The electric brake is on the drive motor.

# 2. Maintenance

**See "Planned Maintenance Schedule" on page 69.**

## 2.1. Fluid Changing

1. Remove drain plug (14, see **page 144**) from drive unit and drain all the fluid.
2. Reinstall drain plug.
3. Remove fill plug (11, see **page 141**).

> ⚠ **CAUTION** Incorrect selection of fluid, for a particular application, may cause damage.

4. Refill using the proper grade fluid (see **page 82**). The capacity of the drive unit is 1-1/2 gallons (6 liters).

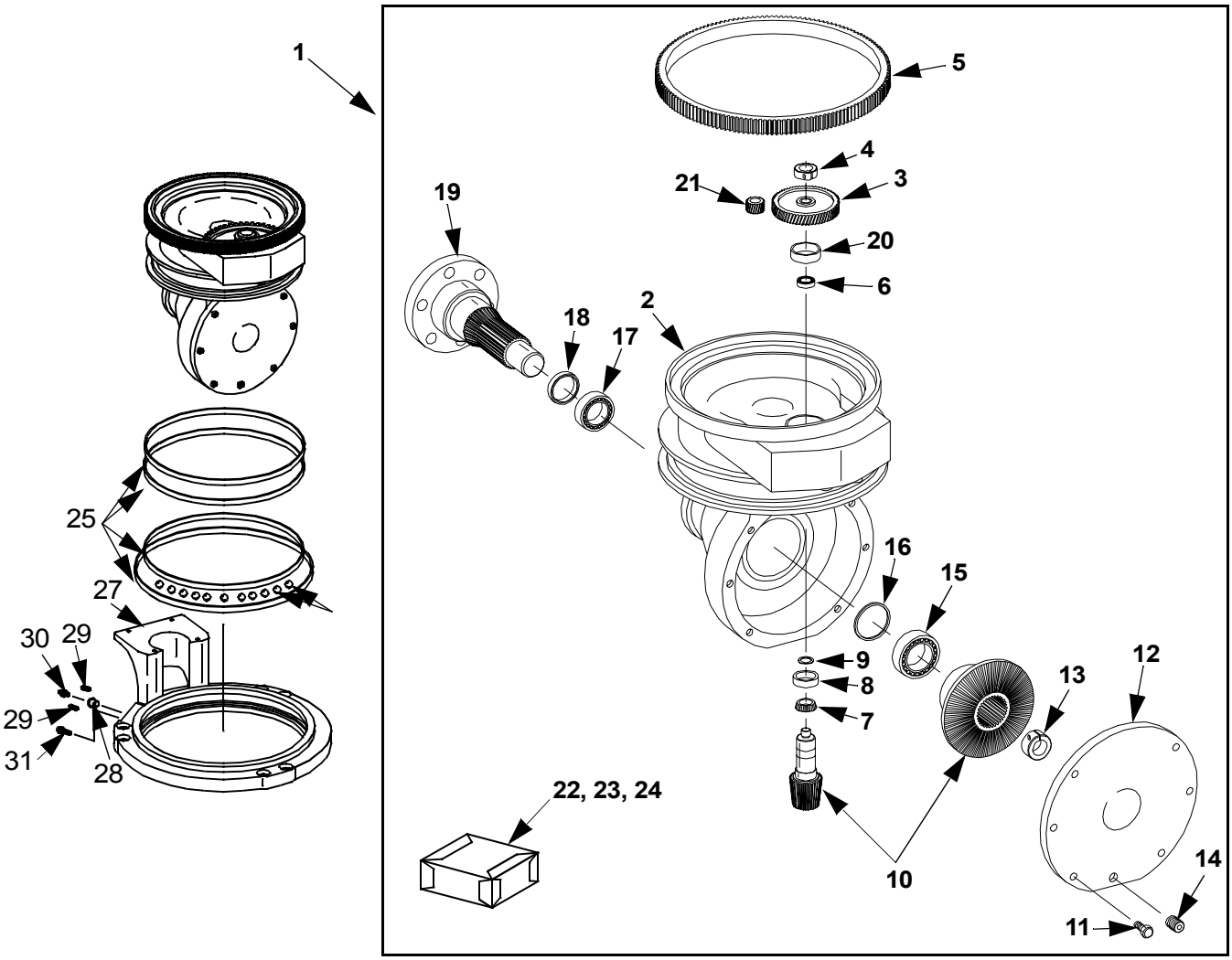
# 3. Troubleshooting

Because of the uncomplicated nature of the transmission, troubleshooting is limited to identifying problems if they are mechanical or electrical in nature. Fluid leaks are obviously mechanical in nature and can be found by visual inspection. Unusual noise and/or slow running could be mechanical or electrical in nature. Generally speaking, if the problem is caused internally in the transmission, then metal contamination will be evident in the oil. If there is a mechanical problem outside of the transmission, then it will become evident by inspecting the drive motor and brakes.

## Transmission Troubleshooting

| Symptom | Probable Cause | Required Action |
|---|---|---|
| Oil Leaks | Damaged lip seal | Replace lip seal, axle shaft bearing and clamp nut |
| | Worn or damaged axle shaft | Replace lip seal, axle shaft bearing, axle shaft, and clamp nut |
| | Gear case/main cover joint | Reseal |
| | Worn or damaged gear case | Replace drive unit |
| Drive wheel wobbles | Worn or damaged axle shaft bearings | Replace lip seal, axle shaft bearing and clamp nut |
| | Worn or damaged axle shaft | Replace lip seal, axle shaft bearing, axle shaft, and clamp nut |
| | Loose wheel mounting hardware | Inspect gear case for damage, retorque mounting hardware |
| Noise | Worn or damaged axle shaft bearings | Replace lip seal, axle shaft bearing and clamp nut |
| | Worn or damaged pinion bearings | Replace pinion bearings, clamp nut, and shims |
| | Worn or damaged gear set, axle shaft is in good condition | Replace lip seal, axle shaft bearing, pinion bearings, gear set and bearings, shims, and clamp nut |
| | Worn or damaged gear set, axle shaft is worn or damaged | Replace lip seal, axle shaft bearing, pinion bearings, gear set and bearings, clamp nut, and axle shaft |
| | Worn or damaged helical gear and pinion | Replace helical gear and pinion |

## Transmission Assembly



| Item No. | Description | Item No. | Description | Item No. | Description |
|---|---|---|---|---|---|
| 1 | Transmission assembly | 12 | Cover | 22 | Kit, seal |
| 2 | Case, gear | 13 | Nut | 23 | Kit, axle shaft |
| 3 | Gear | 14 | Plug, drain | 24 | Kit, drive gear |
| 4 | Nut | 15 | Cone, bearing | 25 | Kit, ring set |
| 5 | Gear | 16 | Shim | 26 | Ball |
| 6 | Cone, bearing | 17 | Bearing | 27 | Ring, pivot |
| 7 | Cone, bearing | 18 | Seal | 28 | Plug, bearing |
| 8 | Cup, bearing | 19 | Axle | 29 | Pin, spiral |
| 9 | Shim | 20 | Spacer | 30 | Fitting, grease |
| 10 | Gear and pinion set | 21 | Gear, pinion | 31 | Screw |
| 11 | Screw, cap | | | | |

# 4. Repair and Rebuild

Visually inspect outside of gear case for damage, wear or cracks. Excessive damage, wear, or cracks in the gear case indicate that the transmission needs to be replaced rather than repaired or rebuilt.

## 4.1. Transmission Disassembly

### Removal

1. Park truck on a level surface.
2. Turn key switch OFF and depress Emergency Power OFF (EPO) switch. Disconnect battery connector from truck.
3. Jack the rear of truck so the drive wheel is approximately 1 inch (25 mm) off the floor. Block truck in this position.
4. Drain transmission fluid.
5. Remove drive tire (see **page 192**).
6. Remove steer motor (see **page 207**).
7. Remove drive motor (see **page 129**).
8. Remove transmission mounting bolts (3, see **page 141**).

> ⚠ **WARNING** Use a suitable hoist for lifting the transmission.

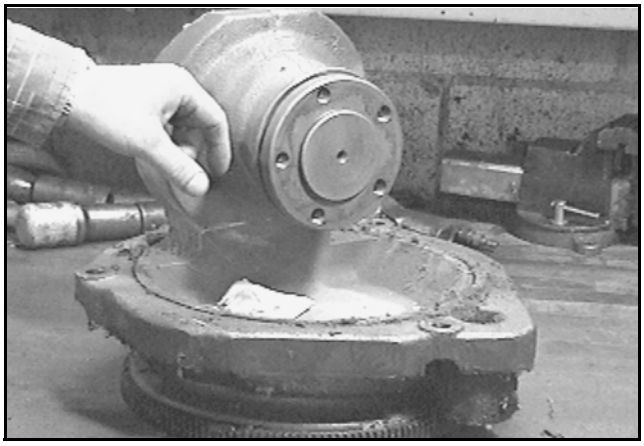
9. Attach an overhead hoist to transmission. Pull transmission assembly out from the top.

## Disassembly

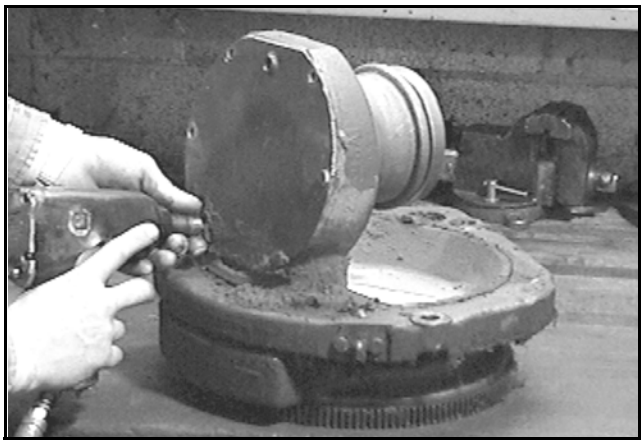
**CAUTION** Safety glasses are required.

**NOTE!** Call-outs in the following procedures refer to illustration on page 144.

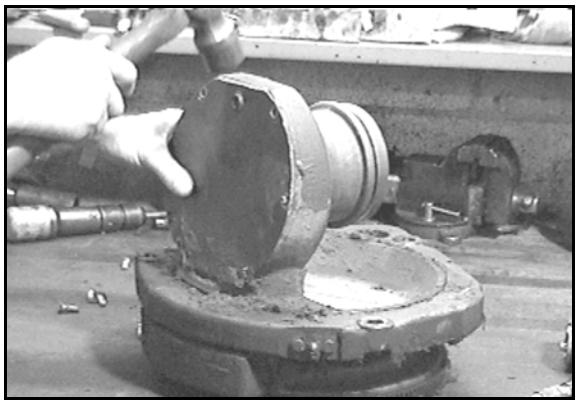
1. Clean the outside of the drive unit thoroughly and drain any remaining oil from the drive unit by removing the drain plug (14).



2. Visually inspect the outside of the gear case (2) for damage, wear or cracks. Pay particular attention to the area where hub wear may be evident.



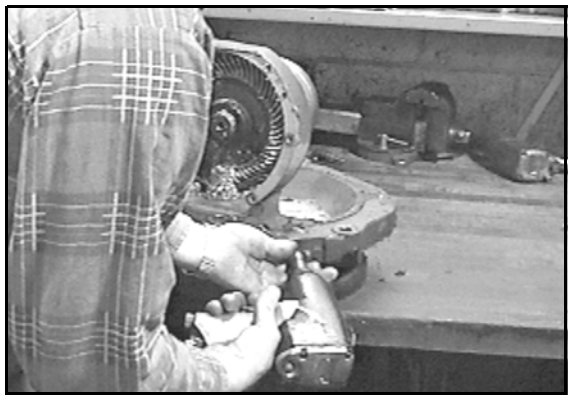
3. Remove cover screws (11) using a 1/2 inch (13 mm) socket.



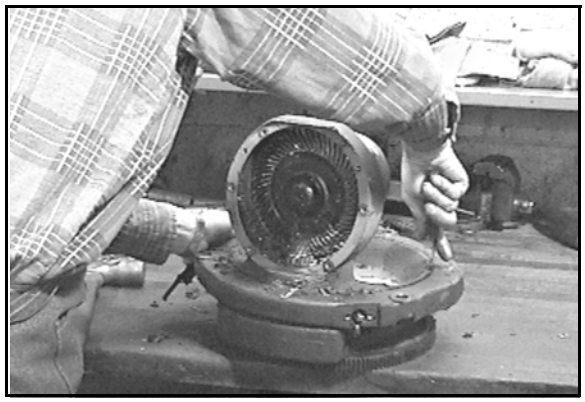
4. Use a mallet to break the cover's seal to the gear case.

## 4.1.1. Pivot Ring

### Removal



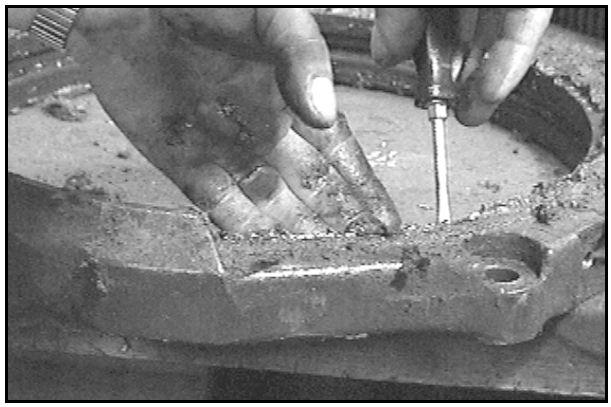
1. Remove the bearing filler plug screws (31) using a 1/2 inch (13 mm) socket.
2. Remove the bearing filler plug (28) with grease fitting.



3. Remove the steel balls (26) through the bearing filler plug hole. Work the steel balls forward by inserting a putty knife between the pivot ring and the gear case. Use care not to damage radial rings. Move the pivot ring slightly from side to side while working the putty knife toward the bearing filler plug hole.

**NOTE!** If the pivot ring will not spin or turn, it is an indication of damaged radial rings and/or excessive wear to the channel in the gear case. If this is the case, replace the entire drive unit. No further disassembly is necessary.

4. After removing all the steel balls, remove the pivot ring (27) by lifting it off toward the drive end of the gear case.



**CAUTION** Due to normal or excessive wear, the edges of the radial rings could be very sharp.

5. Use a screwdriver to remove the radial rings (25) and thrust ring from the pivot ring.

6. Remove the grease fittings using a punch and a mallet.

7. Use a punch and mallet to remove the spiral pins (29) that are used to hold the radial rings in

position. Inspect the spiral pins. If they are worn, replace with new spiral pins when reassembling the pivot ring.

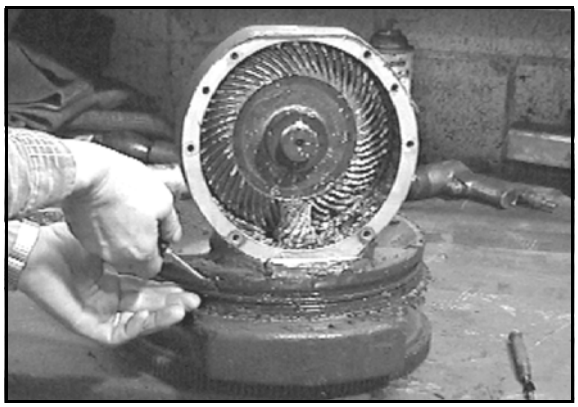
8. Clean the grease from the radial ring channel in the pivot ring. Inspect the channels for wear. If there is excessive wear, replace the pivot ring.

## 4.1.2. Drive Unit Gear Case

| | |
|---|---|
| **NOTE!** | Excessive gear case wear in the channel, pivot ring or hub areas are signs of a damaged gear case. If this occurs, replace the entire drive unit. No further disassembly is necessary. |

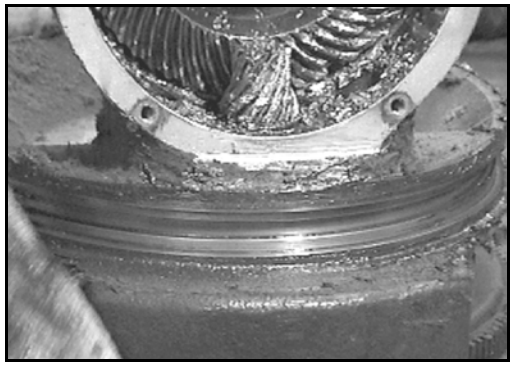
## 4.1.3. Radial Ring

### Removal



| | |
|---|---|
| ⚠ **CAUTION** | Due to normal or excessive wear, the edges of the radial rings could be very sharp. |

1. Use a screwdriver to remove the radial rings (25) from the gear case.

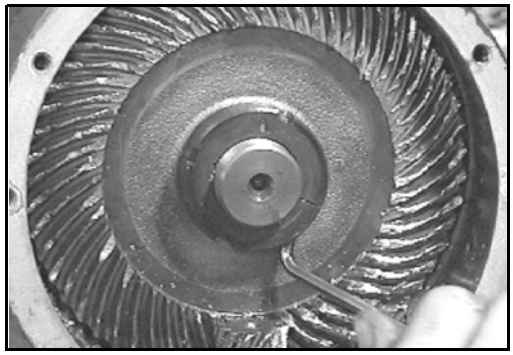


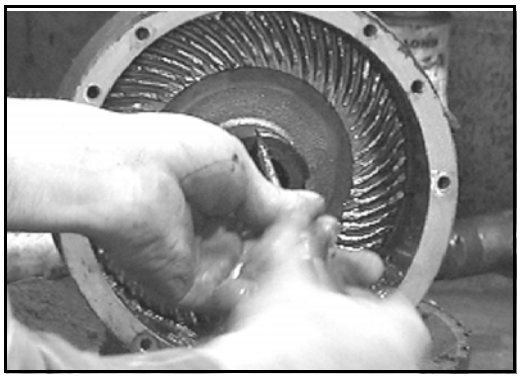
2. Clean grease from the radial ring channel in the gear case. Inspect the channel for uneven wear. If

there is excessive wear, no further disassembly is necessary. The pivot ring must be replaced.

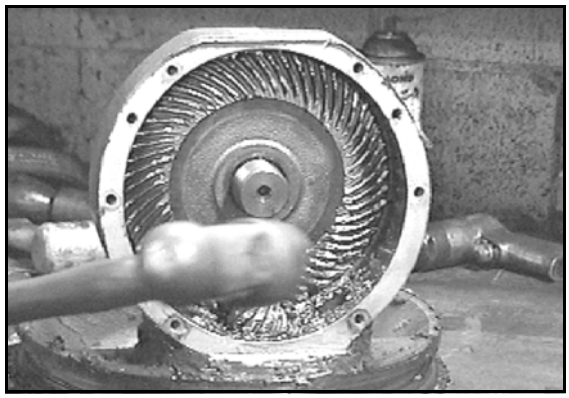
## 4.1.4. Axle Shaft and Bevel Gear

### Removal

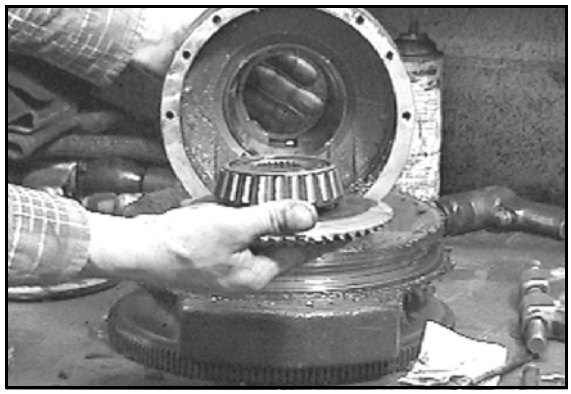




1. Loosen the setscrew locking the clamp nut (13) using an Allen socket or wrench and a breaker bar. An Allen wrench may be needed if the access is limited by the location.
2. Use a screwdriver in the clamp nut slot to turn the clamp nut off.



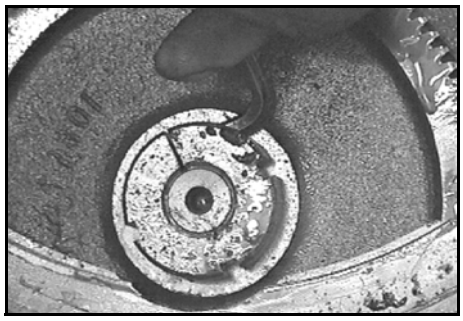
3. Use a brass drift punch and mallet to drive the axle from the gear case. The brass drift punch will reduce the risk of damaged threads on the end of the axle.



4. Lift the bevel gear from the gear case. In cases where severe chipping is present, a mallet may be needed to knock the bevel gear loose.

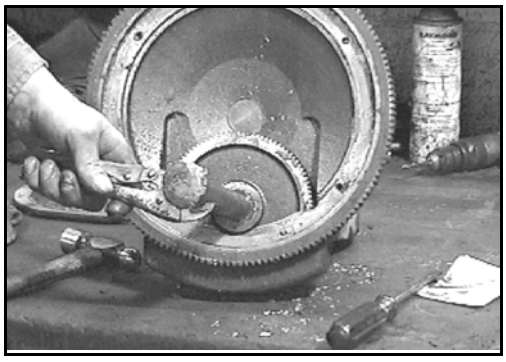
## 4.1.5. Spiral Gear and Helical Gear

### Removal



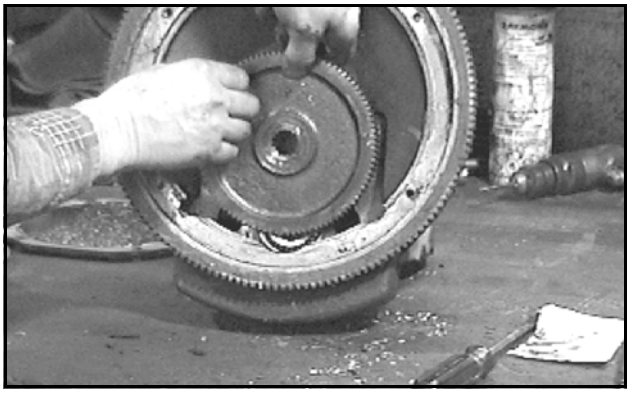
1. Turn the drive unit gear case over to remove the clamp nut (4) from the spiral gear (3). Loosen the setscrew locking the clamp nut (4) using an Allen socket or wrench.

2. Use a screwdriver in the clamp nut (4) slot to turn the clamp nut off. Inspect the clamp nut for damage.



**NOTE!** The spiral pinion may need to be removed with a press or equivalent pressing device.

3. Use a brass drift punch and mallet to drive the spiral gear through the gear case. The brass drift punch will reduce the risk of damaged threads on the end of the spiral shaft.



4. Lift the helical gear (3) and spacer (20) from the gear case.

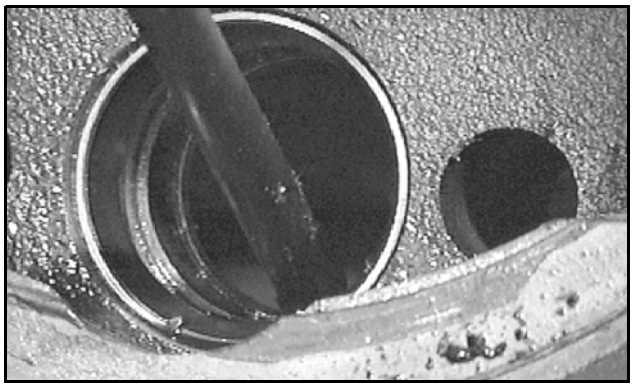
**NOTE!** The bevel gear and spiral gear are a matched set. Their alignment is critical. Do not replace them separately.

5. Inspect the helical gear and the spiral gear for damage or wear.

6. To remove bearing (6), remove the spiral shaft (10) from the gear case. Lift bearing from gear case.

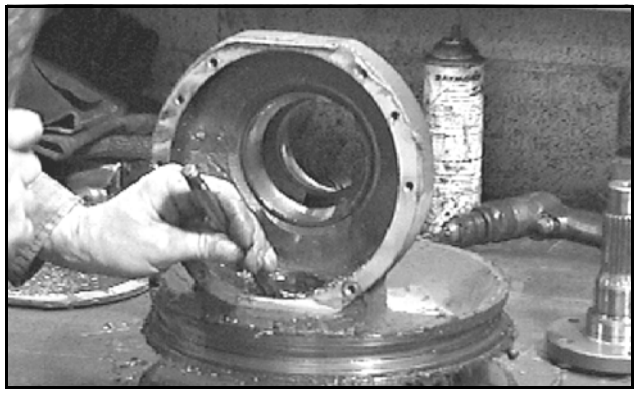
## 4.1.6. Bearing Cup and Shim

### Removal

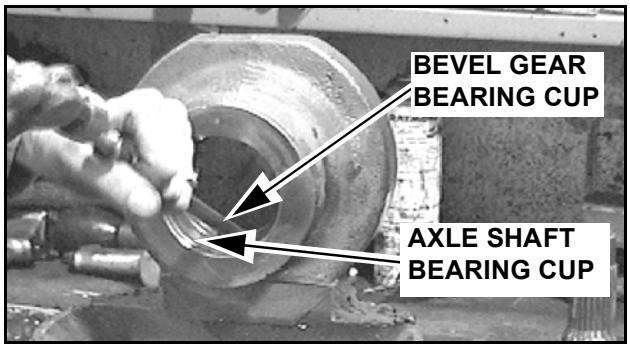


**NOTE!** Because the bearing cups and cones are usually damaged during removal, replace as sets.

1. Use a mallet and long punch to drive the spiral gear bearing cup (8) from the gear case. Take care not to damage the shims. Save the shims for reference in reassembly.



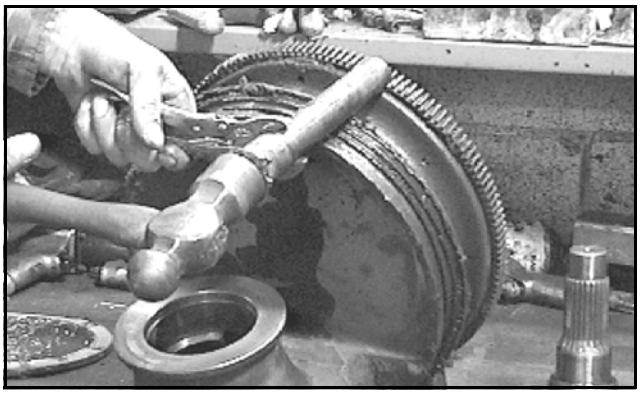
2. Use the mallet and a punch to drive the helical gear bearing cup from the gear case.




3. Remove the axle shaft bearing cup from the gear case using the punch and mallet.
4. Use the mallet and a punch to drive the bevel gear bearing cup from the gear case. Take care not to damage the shims. Save the shims for reference in reassembly.
5. Visually inspect the gear case bores and sealing surfaces for damage or wear.

## 4.1.7. Spur Gear

### Removal



Check the spur gear for damage or wear. If the spur gear is damaged, use a drift punch and mallet to remove it from the gear case.